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PATENT APPLICATION

ATTORNEY DOCKET NO. 200210251-1

IN THE
UNITED STATES PATENT AND TRADEMARK OFFICE

Inventor(s): David Punsalan et al.

Confirmation No.: 9644

Application No.: 10/620,675

Examiner: YUAN, Dah Wei D.

Filing Date: July 15, 2003

Group Art Unit: 1745

Title: A System and a Method for Manufacturing an Electrolyte Using Electrodeposition

Mail Stop Appeal Brief - Patents
Commissioner For Patents
PO Box 1450
Alexandria, VA 22313-1450

## TRANSMITTAL OF REPLY BRIEF

Transmitted herewith is the Reply Brief with respect to the Examiner's Answer mailed on November 14, 2007 .

This Reply Brief is being filed pursuant to 37 CFR 1.193(b) within two months of the date of the Examiner's Answer.

(Note: Extensions of time are not allowed under 37 CFR 1.136(a))

(Note: Failure to file a Reply Brief will result in dismissal of the Appeal as to the claims made subject to an expressly stated new ground rejection.)

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Typed Name: Carla L. Jones

Signature: Carla Jones

Respectfully submitted,

David Punsalan et al.

By _____

Steven L. Nichols

Attorney/Agent for Applicant(s)

Reg No. : 40,326

Date : January 8, 2008

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Rev 10/07 (ReplyBrf)

DUPLICATE

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**Transmitted, herewith, are the following documents:**

1. Transmittal Letter for Response/Amendment with Duplicate Copy (2 pages)
2. Certificate of Transmission (1 page)
3. Reply Brief (10 pages)

200210251-1 10/620,675



IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the Patent Application of

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**REPLY BRIEF**

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Sir:

This is a Reply Brief under Rule 41.41 (37 C.F.R) in response to the Examiner's Answer of November 14, 2007 (the "Examiner's Answer" or the "Answer"). In Section 10, the Answer contains a response to some of the arguments made in Appellant's brief. Appellant now responds to the Examiner's Answer as follows.

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## Argument

(1) Claims 1, 2, 4-18, 55-59 and 61-65 are patentable over Stucker, Takeuchi and Tanabe:

Claims 1 and 57:

Claim 1 recites:

> A method of manufacturing an electrolyte comprising:
> coupling a substrate to a charged electrode; and
> *electrodepositing* a polymeric electrolyte on said substrate.

(Emphasis added).

In contrast, the combination of prior art cited against claim 1 fails to teach or suggest the method of claim 1. Specifically, the cited combination of prior art fails to teach or suggest "electrodepositing a polymeric electrolyte" on a substrate.

According to the Answer, Shucker teaches the claimed electrodepositing of an electrolyte. Specifically, the Answer states that Shucker teaches "an ionically conductive layer is applied via electrophoretic deposition (para. 0033)." (Answer, p. 9). This is a slight mischaracterization of what Shucker actually teaches.

Shucker does not state that an ionically conductive layer is applied via electrophoretic deposition. Rather, Shucker teaches that a *precursor* to an ionically conductive material is electrophoretically deposited. Specifically, Shucker teaches "applying, via electrophoretic deposition, a composition comprising a ***presursor*** [sic] to the ionically conductive layer." (Shucker, paragraph 0033) (emphasis added).

The Shucker process then requires "drying and sintering the green structure and composition in an atmosphere comprising oxygen to remove substantially all of the electrically conductive, oxidizable substrate material." (Shucker, paragraph 0034). This is precisely the type of traditional method that Appellant's claimed subject matter seeks to avoid.

Appellant has recognized that undesirable issues are raised in a process of forming an electrolyte for use in a fuel cell system where the process includes heating or "sintering" of the material. There is no evidence on the record that the prior art has even identified the issues being disclosed and addressed by the Appellant.

According to Appellant's specification, "[t]raditional methods of forming the PEM [Proton Exchange Membrane] (150) and joining the PEM (150) to the electrode layers (140, 160) incorporate a hot press method which causes the perfluorosulfonate ionomer to go from a fully hydrated state to a smaller dehydrated state. When the PEMFC (100) is in operation, the perfluorosulfonate ionomer may become hydrated again causing swelling and structural instability in the PEM (150). The swelling and/or structural instability caused by the hydration of the perfluorosulfonate ionomer may result in an increase of fuel crossover within the PEMFC (100)." (Appellant's specification, paragraph 0024). Appellant's claimed method "for the electrodeposition of polymeric electrolytes on porous substrates, in its various embodiments, simultaneously reduces the likelihood of swelling, increases mechanical stability, and reduces the possibility of methanol crossover. Specifically, the present electrodeposition method provides a method for the electrodeposition of polymeric electrolytes on either a conductive or non-conductive porous substrate. The electrodeposition may occur in an aqueous solution and with a reduction in heat as compared to traditional approaches. As a result, electrolyte swelling is reduced and the likelihood of methanol crossover is reduced." (Appellant's specification, paragraph 0048).

In contrast to Appellant's claim 1, Shucker does not teach or suggest depositing an electrolyte on a substrate coupled to a charged substrate. Rather, Shucker merely teaches depositing a *precursor* material which must then be sintered. Such sintering implicates the very issues that Appellant's claimed subject matter seeks to avoid.

Moreover, Shucker clearly does not teach or suggest electrodepositing a *polymeric* electrolyte. The Answer expressly concedes this point, stating that "Shucker does not teach that the electrolyte is polymeric." (Answer, p. 9).

Consequently, the Answer cites to Takeuchi. (*Id.*). According to the Answer, "Takeuchi et al show that NASICON and Nafion (a perfluorosulfonate ionomer material) are ionically conductive functional equivalents." (*Id.*). Takeuchi does not, however, teach or suggest that the same manufacturing techniques can or should be applied to both NASICON and Nafion. The Answer fails to appreciate this point and, consequently, makes an unwarranted and unsupportable logical leap to reach Appellant's claimed subject matter.

Takeuchi states that "[a]ny polymer may be suitably used in the ion conductive *laminate* of the present invention if it is capable of exhibiting ion conductive electrical conduction." (Takeuchi, paragraph 0118) (emphasis added). Appellant notes that Takeuchi here and elsewhere refers to and teaches using an ionically conductive polymer in a ***laminating*** process of forming an electrode. (Takeuchi, claim 32). As noted above, this is precisely the technique Appellant's teachings are meant to avoid. (Appellant's specification, paragraphs 0024 and 0048).

Consequently, none of the cited prior art references teach or suggest "electrodepositing a ***polymeric*** electrolyte" on a substrate to form an electrolyte. (Emphasis added). Takeuchi teaches the traditional method of heating and pressing material layers to form an ion conducting laminated structure that may include a polymeric material. (Takeuchi, title and claim 32). Shucker teaches electrodepositing a non-polymeric *precursor* to form an ionically conductive layer. Clearly, these disparate teachings do not render obvious, Appellant's claimed subject matter.

Under the analysis required by *Graham v. John Deere*, 383 U.S. 1 (1966) to support a rejection under § 103, the scope and content of the prior art must first be determined, followed by an assessment of the differences between the prior art and the claim at issue in view of the ordinary skill in the art. In the present case, the scope and content of the prior art, as evidenced by Shucker and Takeuchi, clearly did not include Appellant's claimed subject matter and did not even appreciate the latent issues that Appellant has discovered and is seeking to address.

As noted above, Takeuchi teaches the traditional method of heating and pressing material layers to form an ion conducting laminated structure that may include a polymeric material. (Takeuchi, title and claim 32). Apparently, only the Applicant has identified the issues raised by this traditional method that led Appellant to invent the claimed subject matter.

On the other hand, Shucker teaches electrodepositing a non-polymeric *precursor* to an ionically conductive layer. Clearly, the teachings of Shucker and Takeuchi did not put those in the art in possession of Appellant's claimed subject matter.

Neither Shucker nor Takeuchi remotely suggest that a polymeric material is to be electrodeposited. The Answer only seeks to combine the teachings of Shucker and Takeuchi based on hindsight using Appellant's disclosure. This will not support a rejection of Appellant's claims. Under *KSR International Co. v. Teleflex Inc.*, No. 04-1350, 550 U.S. ___ (2007), it remains necessary to identify an apparent reason to combine the teachings of different prior art references without relying solely on material disclosed in Appellant's own disclosure.

Therefore, the scope and content of the prior art, as evidenced by Shucker and Takeuchi, clearly did not include Appellant's claimed subject matter of a method of

manufacturing an electrolyte comprising: coupling a substrate to a charged electrode; and *electrodepositing a polymeric electrolyte on said substrate.*" (Emphasis added). This difference between the prior art and the claimed subject matter is very significant for the art in that Appellant has recognized and addresses undesirable issues that are presented by the heat-based manufacturing techniques taught by both Shucker and Takeuchi. Consequently, the cited prior art will not support a rejection of claim 6 under 35 U.S.C. § 103 and *Graham*.

Independent claim 57 recites: "A method of manufacturing an electrolyte comprising electrodepositing a polymeric electrolyte on a substrate." As amply demonstrated above, the cited prior art fails to teach or suggest a method that includes electrodepositing a polymeric electrolyte on a substrate. Therefore, the rejection of claim 57 should also not be sustained.

Claims 5, 10 and 16:

Claim 5 recites:

> wherein said electrodepositing a polymeric electrolyte further comprises:
> disposing said porous substrate and said charged electrode in a polymeric electrolyte solution containing charged polymeric electrolyte particles; and
> generating an electric field in said polymeric electrolyte solution;
> wherein said electric field accelerates charged polymeric electrolyte particles to said porous substrate.

Claims 10 and 16 recite similar subject matter.

In contrast, the cited prior art references utterly fail to teach or suggest this subject matter. In particular, there is no reference among the cited prior art documents that teaches, suggests or even mentions the claimed "solution containing charged polymeric electrolyte particles."

In this regard, the Answer employs the same flawed logic as was used with claim 1. The Answer again notes that Takeuchi teaches that NASICON and Nafion are equivalent ionic conductors. (Answer, p. 13). The Answer then makes the unsupported leap that both of these very different materials can also be manufactured into an electrolyte using the same techniques, i.e., electrodeposition. There is no basis for this speculation in the cited prior art, it comes exclusively from the teachings of Appellant's own specification. Nowhere does the cited prior art teach or suggest electrodeposition of polymeric electrolyte material.

More importantly to claims 5, 10 and 16, nowhere does the cited prior art teach or suggest a polymeric electrolyte solution containing charged polymeric electrolyte particles. None of the cited references teach or suggest disposing a porous substrate and a charged electrode in a polymeric electrolyte solution containing charged polymeric electrolyte particles or generating an electric field in a polymeric electrolyte solution.

For at least these additional reasons, the rejection of claims 5, 10 and 16 should not be sustained.

Claim 8:

Claim 8 recites "further comprising removing deposited perfluorosulfonate ionomer particles from an outer surface of said porous substrate." The Examiner has failed to indicate how or where the cited prior art teaches this subject matter.

The Answer notes that "Shucker teach[es] that uniform thickness of the electrolyte is preferred (para 0052). Then, characteristic of the Answer, the unsupported logical leap is made that this statement must imply some step of removing depositing particles as recited in claim 8. There is absolutely no basis in the cited prior art for this unreasonable conclusion.

The Answer ignores the possibility that Shucker is merely teaching that the electrolyte should be formed with a uniform thickness as a result of the fabrication technique. Schucker does not apparently even describe within what tolerances the electrolyte thickness should be uniform. Yet, for no legitimate reason, the Answer implies into Shucker the claimed step of removing deposited particles. This begs the question why Shucker did not describe or even mention such a step of removing deposited particles if such were critical and necessary to achieving the preferred uniform electrolyte thickness. Once again, the Answer implies teachings into the prior art that are not reasonably there and with no regard to fairness to the Appellant.

It is the responsibility of the Examiner to demonstrate that all the features of the claim are taught in the prior art. For at least these additional reasons, the rejection of claim 8 is insufficient and should not be sustained.

(2) Claims 2-7 and 60-64 are patentable over Schucker, Takeuchi, Tanabe and Steck

The rejection of claim 2 has already been addressed above. The rejection of claim 2 under this section is traversed for the same reasons.

Claim 3:

Claim 3 recites "wherein said conductive porous substrate comprises a porous stainless steel substrate." Appellant noted previously that, the principal reference Schucker, teaches depositing a precursor to a porous substrate which is later dried and sintered. (Schucker, paragraph 0032-34). Therefore, Schucker's teachings clearly do not include and are incompatible with the claimed stainless steel substrate of claim 3.

The Answer disagrees (Answer, p. 15), but overlooks the clear teachings of Shucker. Shucker states that during the sintering process the substrate used for deposition is burned away. Specifically, Shucker teaches "sintering the green structure and composition in an atmosphere comprising oxygen ***to remove substantially all of the electrically conductive, oxidizable substrate material***." (Shucker, paragraph 0034). Thus, Shucker's teachings are, as Appellant indicated, clearly incompatible with the claimed stainless steel substrate. For at least this reason, the teachings of Shucker could not reasonably by modified based on an incompatible teaching from the other cited prior art references. For at least this reason, the rejection of claim 3 cannot be reasonably sustained.

Moreover, the final Office Action refers to Tanabe as allegedly teaching that "the cathode can be selected from the group consisting of stainless steel [et al.]." (Action of 12/21/06, p. 4). The Answer maintains this position. (Answer, p. 16). However, as Appellant has noted, a cathode is an electrode, not a substrate coupled to an electrode, as recited in claims 1 and 3. Therefore, a teaching that the electrode can be stainless steel, as in

Tanabe, clearly does not also convey that a porous substrate coupled to the electrode is or should be stainless steel. Once again, the Answer seeks to improperly imply teachings into the prior art that are simply not there. Thus, the Answer fails to establish that the prior art teaches or suggests all the features of claim 3. For at least this additional reason, the rejection of claim 3 should not be sustained.

In view of the foregoing, it is submitted that the final rejection of the pending claims is improper and should not be sustained. Therefore, a reversal of the Rejection of December 21, 2006 is respectfully requested.

Respectfully submitted,

DATE: January 8, 2008

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Carla L. Jones